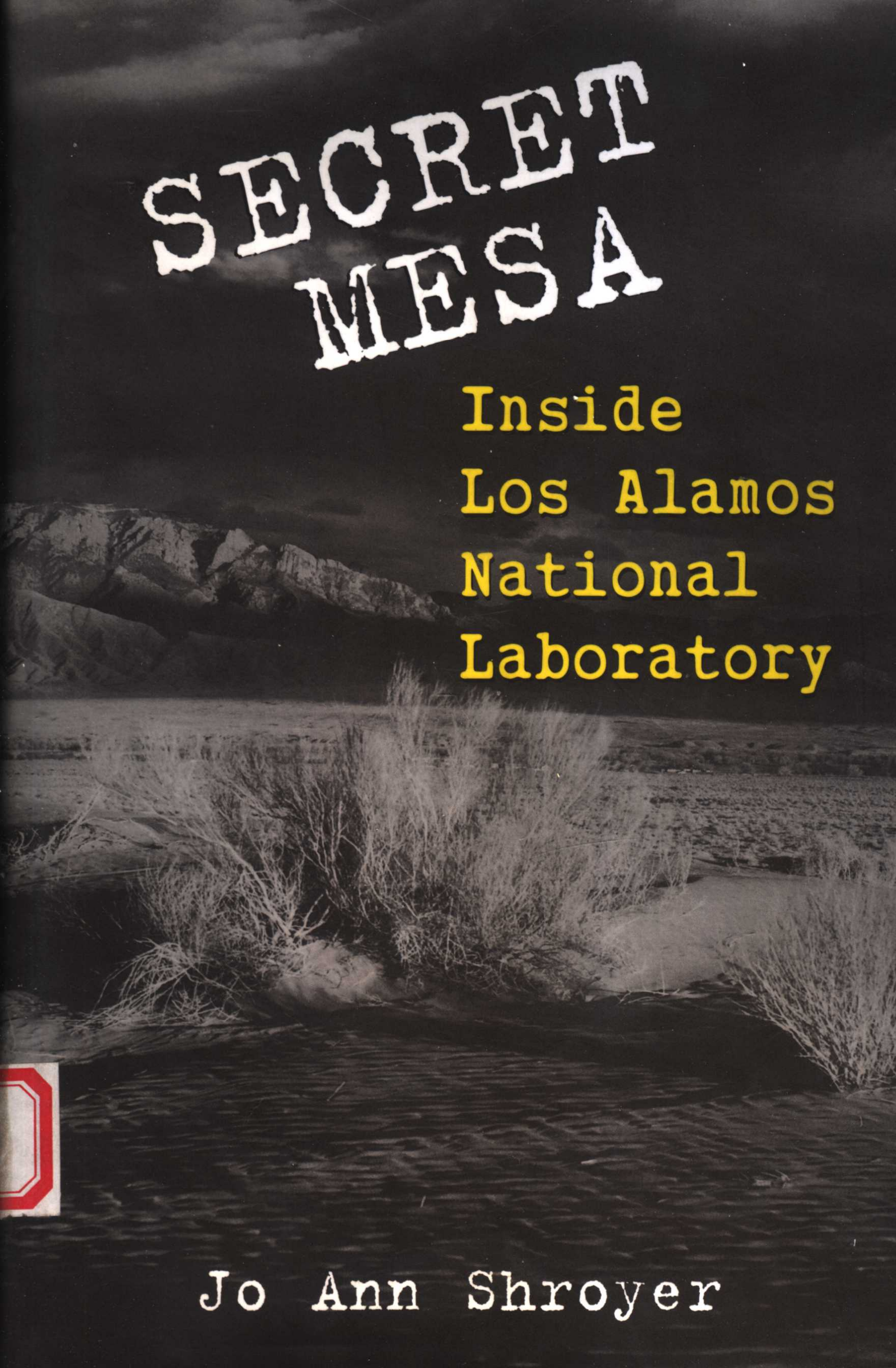

SECRET MESA

Inside Los Alamos National Laboratory

Jo Ann Shroyer

SECRET MESA

Inside Los Alamos National Laboratory

JO ANN SHROYER

John Wiley & Sons, Inc.
New York • Chichester • Weinheim
Brisbane • Singapore • Toronto

This text is printed on acid-free paper.

Published by John Wiley & Sons, Inc.

Library of Congress Cataloging-in-Publication Data

Shroyer, Jo Ann.

Secret mesa : inside Los Alamos National Laboratory / Jo Ann Shroyer.

p. cm.

Includes index.

ISBN 0-471-04063-0 (cloth : alk. paper)

1. Los Alamos National Laboratory—History. 2. Engineering laboratories—New Mexico—Los Alamos—History. 3. Nuclear weapons—Research—New Mexico—Los Alamos—History. I. Title.

QC789.2.U62L677 1998

620'.00720789'58—dc21 97-9517

CIP

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

Acknowledgments

I am grateful to the many people of Los Alamos and Los Alamos National Laboratory who generously took time to talk with me and share their stories, especially Joe and Virginia Martz, James Mercer-Smith, Paul White, Mark Tilden, Karen Brandt, Tom Ribe, and Ed Grothus. Thank you to laboratory archivist Roger Meade, the laboratory public affairs office, the Los Alamos Historical Society, and Mesa Public Library in Los Alamos for their assistance. I also wish to acknowledge my family and friends for their steadfast support and understanding during my work on this book. Thank you to my mother, Frances Shroyer, and my children, Jessy, Katy, Peter, and Claire, for their patience and support, to Nancy Golden and my brother, Beryl L. Shroyer, for their research help, to April Carlson for help with travel, and most especially to my husband, J. G. Preston, for his extraordinary research assistance and insights.

Contents

Introduction

It's easy to feel watched in Los Alamos. During my first visit to the town several years ago, I stopped by the side of the road to take a picture of what I thought was just the Santa Fe National Forest. A small pickup truck did a quick U-turn and parked next to me until I left. When this happened again on another public highway in the area, I began to wonder whose woods these really were.

Later I learned that the technical areas of Los Alamos National Laboratory (LANL) extend far beyond the obvious cluster of gray and tan buildings at its center. They are spread out over forty-three square miles of woods and canyons and are hemmed in by national forest and parklands. It turns out I was nowhere near the heavily guarded areas of the lab, where picture taking would be considered a threat to national security. But I was quietly watched, nonetheless.

This experience was an enticing first hint of the secretive aura—part fact and part fable—that still clings to this unusual place.

The town of Los Alamos (Spanish for "the poplars") was born in secrecy in 1943; it was created by the United States government during the Manhattan Project as the final assembly site for the world's first atomic weapon. Until the federal government took over the mesa, it had been sparsely populated by a few ranchers and the boys at a boarding school for the sons of privileged East Coast families.

Wide modern highways climb the flanks of the mesa now, but in the early days, the road to Los Alamos was rocky, prone to muddy washouts, and full of hairpin curves. The roads to the top of the mesa are lined with cliffs of tawny, pockmarked rock that looks like old Swiss cheese but is actually solidified volcanic ash, or tuff. In fact, the creators of the world's first atomic explosion built their weapon on the front porch of an ancient giant—a massive volcano that erupted a million years ago, rolling tons of ash over what is now northern New Mexico and launching it on the wind to as far away as Iowa. The Jemez Mountains that tower above Los Alamos on the west are packed with some one hundred silent volcanoes. Los Alamos scientists have experimented at tapping the heat that still remains deep in the rocks, while hikers bathe in the warmth of the many hot springs that rise from the earth in wooded canyons.

Today Los Alamos is the company town for one of the biggest multidisciplinary scientific research centers in the world, conducting a wide range of basic research that has little to do with weapons development. However, as the nation's premier weapons laboratory, LANL owes its existence and its billion-dollar annual budgets to its central mission, the design of nuclear weapons. Fully 80 percent of the warheads in the U.S. stockpile came from the fertile minds of Los Alamos scientists.

The demographics of Los Alamos are rather strange for a town of its size, fewer than twenty thousand people. The population includes more Ph.D.'s—most of them physicists and engineers—per capita than anywhere else in the world, a recipe that guarantees interesting town government, school politics, and family life. There are children in Los Alamos who do not know what their fathers and mothers do for a living and spouses and neighbors who can't talk to each other about work, held in check by security clearances and long-practiced habits of secrecy.

The work of the laboratory was shut off from the prying eyes of ordinary citizens for many years, existing on a secret mesa that was protected first by the army, later by hired protection services, and always sheltered by the classification system that keeps secret a prodigious amount of the information that lab scientists have collected over the past fifty years. While recent openness initiatives have loosened the tight rein on information, the laboratory is still a secretive place because of the sensitive nature of weapons work.

In New Mexico the town is an anomaly—a predominantly white society in the midst of a multicultural state that is mainly Hispanic and Native American. It is an affluent community in a state that is one of the poorest in the nation. And its lifeblood is data—the concrete, observable information that is science—while it is surrounded by Indian cultural traditions whose roots are held in place by powerful, intuitive mythologies. Santa Fe, a magnet for people who live by art and intuition, lies just thirty-five miles south of Los Alamos, but at least a light-year away in terms of attitude and focus. Santa Fe is alive with antinuclear activists who keep a suspicious watch on their neighbors on the mesa.

During the day Santa Fe and Los Alamos are invisible to each other; but at night when the lights come on, Santa Fe—whose sandy-hued adobe houses seem to have sprung whole from the bones of the earth—reveals itself not as the quaint Hispanic village it wants to be, but as the big town that it really is. And the lights of Los Alamos—a town that shows little organic connection to its place—float in the high distance like primitive campfires that are visible for miles. The two towns, as one Los Alamos scientist put it, are like Sparta and Athens: at war with each other, but at the same time needing each other in some fundamental way in order to be complete.

The spirit of Los Alamos is best understood within the context of its history—a story that is still vividly alive in the memories and the ongoing mission of both the town and the laboratory. How a team of scientists and engineers, many of them very young, came there and worked against time to create an atomic bomb has become a twentieth-century legend.

The Manhattan Project began when President Franklin D. Roosevelt learned from scientists about the possibility of a horrific new weapon based upon research that began with an early-twentieth-century prediction by Albert Einstein, who had theorized that immense amounts of energy were bound up in the nuclei of atoms. If the bonds holding the nuclei together could be broken, the energy would be released.

Fission was first recognized in the laboratory by German physicist Otto Hahn and Austrian physicist Lise Meitner. When Meitner fled to Sweden to escape Nazi persecution, German chemist Fritz Strassman became Hahn's partner, and together, with Meitner's advice from afar, they worked in 1932 to identify the particles that emerged when neutrons bombarding uranium atoms caused their nuclei to break apart. The mass of the resulting fragments was less than that of the original atom, and it soon became clear that the missing mass emerged from the interaction as energy. New neutrons were also produced by the fissioning of uranium, and were capable of splitting even more atoms, and thus sustaining a chain reaction. If uncontrolled, that chain reaction might set off an explosion. Italian physicist Enrico Fermi proved it in 1934, showing that the uranium nucleus could capture slow neutrons and split apart, releasing massive amounts of energy.

The world scientific community was aware of these astonishing discoveries, and it was only a matter of time, most thought, before someone learned how to make a fission weapon. Those who understood it assumed that Hitler's scientists would understand it as well, and the possibility that the German dictator could get his hands on such a device was a terrifying prospect. Otto Hahn is said to have considered suicide over the consequences of his research.[1] Hungarian theoretical physicists Leo Szilard, Eugene Wigner, and Edward Teller convinced Einstein to write a letter to President Roosevelt, warning him of this potential danger. Ultimately, that act, which Einstein came to regret, set into motion a giant technical effort that cost two billion wartime dollars, brought the long and bloody war with Japan to an abrupt end, and changed the complexion of world politics forever.

The task was named the Manhattan Project because much of the early work was done in research institutions in New York City and coordinated by the army's Manhattan Engineer District.

By 1942, Fermi, who immigrated to the United States in 1938, had achieved the first controlled chain reaction with a graphite-barricaded reactor underneath the football stadium at the University of Chicago. It was there that the atomic age really began.

The director of the nationwide effort to create a fission weapon was army Major General Leslie R. Groves, a hard-nosed military man with a reputation for bringing off huge, complicated building projects like the construction of the Pentagon, which he had supervised. He was a pragmatist who saw the sense in locating the secret laboratory on the mesa, while J. Robert Oppenheimer, a theoretical physicist from Berkeley and the newly appointed director of the lab, suggested the spot because of its stunning natural beauty. Oppenheimer had summered in the area for years and believed that the forceful and still largely untamed mountains, mesas, and canyons of northern New

Mexico would provide respite and solace during what was sure to be a difficult task. Furthermore, it would be a constant reminder of nature's dominion, an important consideration for scientists who pry so deeply into her secrets.

But there were more practical requirements to satisfy. This was an isolated high plateau in the remote mountains of a sparsely populated state, far removed from either coast and the threat of attack, guarded by high cliffs and a primitive road. A perfect place for keeping secrets.

Oppenheimer accepted Groves's tight external security in exchange for the free flow of information within the laboratory. The military's normal procedure is to protect secret information by restricting a worker's access to only those data that are relevant to his or her work. The physicists, chemists, metallurgists, and engineers at Los Alamos would have to work closely together in free communication, Oppenheimer argued, if this project was going to succeed. The notion of open collaboration among scientists of different disciplines is still celebrated today at the laboratory and is an important part of the Oppenheimer legacy. This principle led to a critical technical breakthrough that made the plutonium bomb possible, and it makes today's laboratory uniquely suited to grand technical challenges, lab spokesmen say.

The researchers hired to work at the wartime lab came from university laboratories all over the country—mainly the University of California at Berkeley, the California Institute of Technology, the University of Chicago, Columbia University, and Cornell University. The nucleus of the group was composed of scientists who had been associates and students of Oppenheimer. At Los Alamos they worked alongside European scientists who had escaped fascism and had a deeply personal interest in preventing Hitler from getting the atomic bomb first. As a result, the atmosphere on "the hill," as it came to be known to its residents, was intense.

There were no guarantees that the job they had been asked to do could be done. It has been said that the youth of the researchers, whose average age was twenty-five, may have contributed to the success of the project; they weren't old enough to know how impossible it really was. They were to study the properties of fissionable materials and figure out precisely how to build this "gadget," as it came to be called. However, the amounts of fissionable materials required for the actual weapon did not yet exist. Reactors were built at Oak Ridge, Tennessee, and Hanford, Washington, to separate the needed and quite rare uranium 235 from the isotopes of uranium that formed the bulk of the element that existed on the planet. The Hanford plant set to work making plutonium—a substance that may have once existed in the earth's crust but was now available only in minute man-made portions.

Meanwhile the muddy inaccessibility of the mesa was an impediment to the work that had to be done. There was no local power company to provide energy for the operation of machinery, for example, so the scientists were forced to use four old diesel generators found at an abandoned mine in Colorado. The resulting power plant, replete with a grizzled old miner who came with the equipment, ran with intermittent success. Power fluctuations were a continuing problem. Water was in short supply and had to be carried in overland pipes from Guaje Canyon seven miles north of Los Alamos. Army engineers built dams there to catch mountain runoff. The water was gritty and smelled of chlorine and leaf mold. It caused in newcomers a three-day illness dubbed "Hillitis." The water tank was equipped with a gauge that the new town's citizens consulted before they allowed themselves the luxury of a bath.

The scientists had been permitted to bring their families to the mesa and, being young, created an inconvenient baby boom that overwhelmed the scarce and hastily built housing. The initial plan for the laboratory had allowed for no more than a hundred scientists, but the working population proceeded to double every nine months. Having been promised a complete community with homes, schools, a hospital, a post office, a library, movies, restaurants, a laundry, and all the other accoutrements of comfortable small-town life, the families were stunned by what they found: a muddy plateau with primitive housing, an inadequate water supply, no telephones, censored mail, and armed guards everywhere. Memoirs of the time paint a picture of muddy streets overrun by children and dogs, with everything surrounded by high barbed-wire fences that reminded the Europeans of concentration camps.

The long hours of hard work and the discomforts and privations suffered by the scientists and their families were offset by the conviction that they were doing important scientific work that would affect the outcome of the war. They were sustained by patriotism and the excitement of being involved in such an important secret project. These sentiments are still honored in Los Alamos and continue to motivate many laboratory workers today. Retired Manhattan Project veterans and Cold Warriors, many of whom have chosen to stay in Los Alamos, are mystified by the prevailing attitude in the outside world, as they call it, that they should be ashamed of their history. In contrast to the way Los Alamos is often portrayed, many of its residents would prefer to think of it as a symbol of peace, the place where technology made world war unthinkable. The concept of nuclear weaponeers as peacemakers was well established during the Cold War, when some Strategic Air Command bases boasted billboards that declared, "Peace Is Our Profession"; but the notion originated with Oppenheimer and others involved with the Manhattan Project, who believed at the time that humankind, given this terrible power to destroy itself, would find redemption instead.[2]

Given its dramatic history and its strategic importance to U.S. national defense, Los Alamos makes a disappointing first impression. It's neither formidable nor pretty, looking as it does like something a physicist had designed strictly for function and practicality. This is actually very close to the truth because when the physicists began arriving on the mesa during World War II, the experimentalists—unlike the theoreticians who needed only blackboards and peace in which to think, read, and talk—had nothing to do until their buildings and equipment were in place, so they busied themselves putting up structures.

While most of the wartime buildings are gone now, drab government-issue style dominated Los Alamos during the fifties until residents were allowed to build and own their own homes. The barracks-like buildings left over from the early Cold War years now serve as the town's low-rent district. But out on the fingers of the plateau and perched on the edges of the breathtaking canyons there are woodsy and interesting homes like those you might find in any mountain resort community. Nevertheless, there is an aura remaining of that government-run town that gives no quarter to luxuries not vital to the scientific mission. Still dependent on federal dollars and the unpredictable winds of war and politics, the lab and the community invests in function, not flash.

During the war, Los Alamos was closed to all but the families who worked and lived there, plus a few important government representatives and consulting scientists who were allowed to visit. The town remained closed until 1957, when the fences came down, to the dismay of many of the residents who had grown accustomed to feeling safely shut off from the outside world. They unsuccessfully petitioned to keep the gates closed.

Habits of secrecy still cling to the mesa, where a four-hundred-strong civilian contract security force guards the laboratory and, along with the community's police force, watches over the town. The guards are mostly New Mexicans whose primary job is to prevent plutonium and other dangerous substances from falling into the wrong hands. Technical Area (TA)-55, the plutonium-processing facility at the laboratory, may be one of the most intensely guarded acreages in the United States. It is an awesome place, surrounded by a maze of barriers topped with glinting spirals of razor wire and strings of prickly barbed fencing, while motion detectors and armed guards cast suspicious eyes in every direction. The guards are specially trained to turn back terrorist attacks, the chief security worry at Los Alamos. In one such training exercise during the 1994 Christmas season, a guard was shot to death by a colleague who somehow accidentally loaded his machine gun with live ammunition. Locals will tell you that it's important to respect the laboratory's guards. "If they tell you to halt, you'd better do it," a lifetime resident told me.

In their tan uniforms, black boots, and black-holstered sidearms, the security guards have a vaguely foreign, militaristic appearance. As a result, the process of "going behind the fence"—the laboratory euphemism for visiting secured areas—can be unsettling at best. To its freewheeling Santa Fe neighbors and, indeed, anyone not used to the culture, the tightly buttoned and stern public demeanor of Los Alamos National Laboratory is somewhat distasteful and threatening.

Los Alamos has been described as the world supply of nerds—badly dressed, absent-minded brainiacs who can't manage to wear matching socks. That turns out to be an overstatement; what you're likely to see is merely the sort of eccentricity and casual dress that is common on many college campuses. In winter you'll notice the ruddy faces and telltale goggle marks of the Alpine skier. People rush out to the mountains during their lunch breaks to get in an hour of skiing before they go back to their labs and offices. The ski hill is a privately owned membership club that dates back to the winter of 1944–1945 during the Manhattan Project. Ukrainian chemist George Kistiakowsky—who had produced the explosive lenses for Fat Man, the bomb that destroyed Nagasaki, and later fervently opposed nuclear weapons—cleared trees for the ski run by detonating necklaces of surplus plastic explosives around the trunks, effectively cutting them in half. Admiral William "Deak" Parsons, the director of the ordnance division in the wartime laboratory, was quoted as saying, "Isn't it wonderful to see five thousand people intent on a single purpose—skiing!"[3]

On any day you will see people jogging, biking, in-line skating, or walking to work, if they are not roaring around in the ubiquitous four-wheel-drive vehicles and pickups, nearly always topped with ski racks. The sort of driven personality that can labor night and day in a laboratory is capable of applying the same intensity of purpose to recreation. Los Alamos takes its hobbies very seriously. The lab's cafeteria, like its Wellness Center, dishes up an inoffensive menu of healthful alternatives for lab employees. You would be hard-pressed to find anyone who smokes.

Los Alamos is a complex place, not easily understood. It is populated by bright, quirky, and unusual people who continue to do important but sometimes controversial work, much of it completely unrelated to weapons design. And while there are few monuments to its history in the town, the community is still saturated with the details and purpose of its origin. That human and technical background is important to understanding the Los Alamos of today—a community that has been both a beneficiary and a victim of its own history and mythology.

But the past is not the subject of this book. Los Alamos, like Hiroshima and Nagasaki, is a living, breathing human community that survived the dramatic events that put it on the map. The lab was slated to close after the war ended; many of the scientists who worked on the bomb went back to their university laboratories, some of them so horrified by what they had created that they spent the rest of their lives opposing nuclear weapons. But LANL thrived and grew fat on the mechanics of the Cold War, and only in recent years, with the fall of the Berlin Wall and the implosion of the Soviet Union, did the institution have to worry about its future, justify its existence, and come to grips with the changing attitude toward its mission. The demand for new nuclear weapons had already begun to fade in the wake of landmark arms control agreements, and with the halt of underground testing, the laboratory was forced to reexamine its reason for being.

But the lab sensibly seized upon new technical challenges, including the immense task of cleaning up the idle and widely contaminated nuclear weapons production complex and somehow containing or eliminating the tons of plutonium and other radioactive detritus that remain. According to a recent Department of Energy estimate, the cleanup cost could consume hundreds of billions of dollars and take more than sixty years to accomplish. Who is more qualified to clean up the mess, lab managers ask, than the people who understand the materials best?

Furthermore, until the United States decides what to do with its remaining nuclear weapons stockpile, someone has to look after it, lab spokesmen explain. As weapons age, the materials from which they are constructed will surely degrade, as will their performance. So they must be regularly maintained, until such time that they, like the production complex that made them, can all be decommissioned—an unlikely prospect in a world where small nations increasingly see nuclear weapons as the big stick that will guarantee their sovereignty.

Many Los Alamos weapons scientists still advocate limited underground testing, describing the maintenance conundrum this way: just as a car would cease to run if you put it on blocks in a garage for thirty years—the age of the oldest nuclear weapons in the U.S. stockpile—and neglected to maintain or test it, so too would nuclear weapons cease to function. They are, after all, technical beasts made with unstable materials that change over time.

Still other weapons experts at the laboratory are convinced that just as they adapted to the ban on aboveground testing, they can likewise deal with the ban on underground testing, identifying new technical tools for what is now called science-based stockpile stewardship. However it's done, lab spokesmen say, the guarantee that nuclear weapons will work if they are called upon is still at the heart of deterrence theory.

It is an irony of our times, however, that while the United States and the former Soviet republics are decommissioning their nuclear weapons as quickly as possible, there are small countries that can't wait to get nukes of their own. Several nations exist as undeclared but undeniable nuclear states—Israel being the most notable among them, having perhaps as many as two hundred nuclear weapons in its secret stockpile.

Stopping the furious proliferation of nuclear weapons has become an important mission for both the United States and Russia. Los Alamos scientists have taken a leading role, claiming that the collapse of the Soviet Union has made the world not safer but more dangerous, because the chaos in the crumbling former Soviet Union has allowed nuclear materials to be smuggled out. Such materials could find their way into the hands of people who might show less restraint than did the world's two superpowers during the Cold War. Indeed, several weapons designers at Los Alamos have predicted that sometime within the next ten years a nuclear weapon will be used in anger somewhere in the world, most likely lobbed over the back fence of small but hostile neighbors in limited but dangerous regional conflicts.

Los Alamos scientists have worked to prevent such developments by assisting the Russians in beefing up security for their nuclear materials, and initiating cooperative research programs with scientists at their sister laboratory in Russia. The purpose for the joint research was not only to engage the Russian scientists in challenging work that might prevent them from taking their skills to proliferant countries, but also to allow U.S. scientists to learn from their formidable former adversaries, who have developed some nuclear technologies that are more advanced than U.S. nuclear research.

In addition to its role in maintaining the U.S. weapons stockpile, cleaning up the contaminated weapons complex, and seeing to the disposition of surplus plutonium, the laboratory continues to do basic research in many other areas of science, concentrating on core competencies in nuclear technology; high-performance computing and modeling; dynamic experimentation; systems engineering and prototyping; materials technology; laser, particle, and ion beam technologies; and complex systems. Such a list doesn't begin to convey the wide variety of research being done at the laboratory by people who were meticulous about distancing themselves from weapons work when I interviewed them. Such compartmentalized thinking is another feature in the complex social structure of Los Alamos National Laboratory.

Meanwhile, a large public affairs department churns out press releases and glossy publications extolling the benefits of LANL research. As the lab's public affairs director, Scott Duncan, bluntly put it, his department's primary purpose is to "attract $1.1 billion of funding."[4] At the same time, lab public affairs tries to communicate meaningfully with the public by way of the press, with whom the laboratory shares a mutual and well-oiled distrust. The results have been mixed.

The problem is, most people aren't willing to trust or believe Los Alamos scientists nowadays. After having worked for years in silence and secrecy, these researchers have more recently been forced to court public understanding and acceptance in order to thrive. But they are not very good at it. And it means swimming upstream against a powerful current of cultural distaste for the work that the laboratory has done these past fifty years. Perhaps they were too arrogant after all, lab spokesmen have told me. Perhaps they should have told the public and Congress more about what they were doing with their generous and largely unsupervised annual budgets.

One feature of this new era of openness for government laboratories has been the unhinging of its tightly bound secrets. Among the legacies of of the Cold War was an increase in government secrecy, with not only a corresponding growth in the size of government but also an accumulation of classified documents that is so large that it surpassed the ability of the Department of Energy (DOE), the federal overseer of the weapons complex, to deal with it. In an attempt to reduce the mass of classified documents, to release information useful to the cleanup and safe disposition of nuclear waste and U.S. plutonium stores, and to clarify what really should be kept secret, the DOE has invested in a multimillion-dollar computer program to mine this data mountain. Its first assignment was to scan some hundred million pages of documents.

It was unfortunate timing for the laboratory that at the very juncture when it most needed public understanding and support for its mission, the institution's trustworthiness was called into question by a particularly disturbing aspect of the new Department of Energy openness policy. Energy Secretary Hazel O'Leary decided to reveal the nature of Cold War plutonium experiments on humans, many of them vulnera-